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PATENT

PATENT APPLN. NO. 10/600,571
SUBMISSION UNDER 37 C.F.R. § 1.114

IN THE CLAIMS:

1. (currently amended) A process for purifying exhaust gas from gasoline engines comprising the steps of preparing an exhaust gas purifying-use catalyst for purifying first exhaust gas produced under a driving condition at which an air-fuel ratio is stoichiometric, said exhaust gas purifying-use catalyst containing a noble metal and a fire-resistant inorganic oxide carrying the noble metal, said catalyst including at least one of platinum and iridium, said fire-resistant inorganic oxide being active alumina, titania, zirconia, alumina-titania, alumina-zirconia, or titania-zirconia, an amount of the noble metal being in a range of 0.01 to 50 g/liter with respect to the catalyst volume, an amount of the fire-resistant inorganic oxide being about 50 to 300 g/liter with respect to the catalyst volume, and a water-soluble compound being used as a source of the noble metal; and purifying exhaust gas from a gasoline engine of a fuel-direct-injection type by contacting said exhaust gas with the exhaust-gas purifying-use catalyst;

wherein said gasoline engine of a fuel-direct-injection type is one which allows fuel to be directly injected inside a cylinder of the engine,

wherein the exhaust gas varies between the first exhaust gas having an exhaust-gas temperature in a range of 350 to 800°C at an inlet of the catalyst and a second exhaust gas that forms a more oxidizing, low-temperature atmosphere as compared with the first exhaust gas state, depending on changes in air-fuel ratio, and

wherein the second exhaust gas is controlled so as to have an exhaust-gas temperature which is lower than the first exhaust gas, and which is in a range of 200 to 350°C at the inlet of the catalyst.

2. (original) The process for purifying exhaust gas from gasoline as defined in claim 1, wherein the exhaust gas is purified by removing hydrocarbon, carbon monoxide and nitrogen oxides from the exhaust gas by the use of the catalyst.

3. (previously presented) The process for purifying exhaust gas from gasoline engines as defined in claim 1, wherein the first exhaust gas state appears when the air-fuel ratio is in the range of 13 to 15, and the second exhaust gas state appears when the air-fuel ratio exceeds the above-mentioned air-fuel ratio.

4. (original) The process for purifying exhaust gas from gasoline engines as defined in claim 3, wherein the second exhaust gas state appears when the air-fuel ratio ranges from more than 15 up to 50.

5 - 6. (canceled)

7. (previously presented) The process for purifying exhaust gas from gasoline engines as defined in claim 1, wherein said catalyst further comprises a transition metal, an amount of the transition metal being in a range of 0.01 to 50 g/liter with respect to the catalyst volume, and a water-soluble compound being used as a source of the transition metal contained in the catalyst.

8. (previously presented) The process for purifying exhaust gas from gasoline as defined in claim 1, wherein:

said gasoline engine includes: a cylinder that serves as a combustion chamber for gasoline as a fuel; an ignition plug; an injector that is used for injecting the fuel; a control section for controlling an ignition timing of the ignition plug and an amount of fuel injection of the injector, and

the control section controls an air-fuel ratio depending on the injector so as to cause the gasoline engine to be in the second exhaust gas state.

9 - 10. (canceled)

11. (previously presented) A process for purifying exhaust gas from gasoline engines comprising the steps of preparing an exhaust gas purifying-use catalyst for purifying first exhaust gas produced under a driving condition at which an air-fuel ratio is stoichiometric, said exhaust gas purifying-use catalyst consisting essentially of a noble metal and a fire-resistant inorganic oxide carrying the noble metal, said fire-resistant inorganic oxide being active alumina, titania, zirconia, alumina-titania, alumina-zirconia, or titania-zirconia, an amount of the noble metal being in a range of 0.01 to 50 g/liter with respect to the catalyst volume, an amount of the fire-resistant inorganic oxide being 50 to 300 g/liter with respect to the catalyst volume, and a water-soluble compound being used as a source of the noble metal contained in the catalyst; and

purifying exhaust gas from a gasoline engine of a fuel-direct-injection type by contacting said exhaust gas with the single exhaust-gas purifying-use catalyst;

wherein said gasoline engine of a fuel-direct-injection type is one which allows fuel to be directly injected inside a cylinder of the engine,

wherein the exhaust gas varies between the first exhaust gas having an exhaust-gas temperature in a range of 350 to 800°C at an inlet of the catalyst and a second exhaust gas that forms a more oxidizing, low-temperature atmosphere as compared with the first exhaust gas, depending on changes in air-fuel ratio, and

wherein the second exhaust gas is controlled so as to have an exhaust-gas temperature which is lower than the first exhaust gas, and which is in a range of 200 to 350°C at the inlet of the catalyst.

12. (previously presented) The process for purifying exhaust gas from gasoline as defined in claim 1, wherein the catalyst further contains, as a co-catalyst, a rare-earth metal.

13. (previously presented) The process for purifying exhaust gas from gasoline engines according to claim 1 wherein the

exhaust-gas purifying-use catalyst that contains a noble metal is obtained by impregnating a noble metal in the fire-resistant inorganic oxide.

14. (previously presented) The process for purifying exhaust gas from gasoline engines according to claim 11 wherein the single exhaust-gas purifying-use catalyst that consists essentially of a noble metal is obtained by impregnating a noble metal in the fire-resistant inorganic oxide.

15. (previously presented) The process for purifying the exhaust gas as set forth in claim 1, wherein said second exhaust gas is controlled so as to have an exhaust-gas temperature in a range of 200 to 300°C at the inlet of the catalyst.

16. (previously presented) The process for purifying exhaust gas as set forth in claim 1, wherein said second exhaust gas is controlled so that an exhaust-gas temperature of said second exhaust gas is at least 200°C lower than an exhaust-gas temperature of the first exhaust gas, at the inlet of the catalyst.